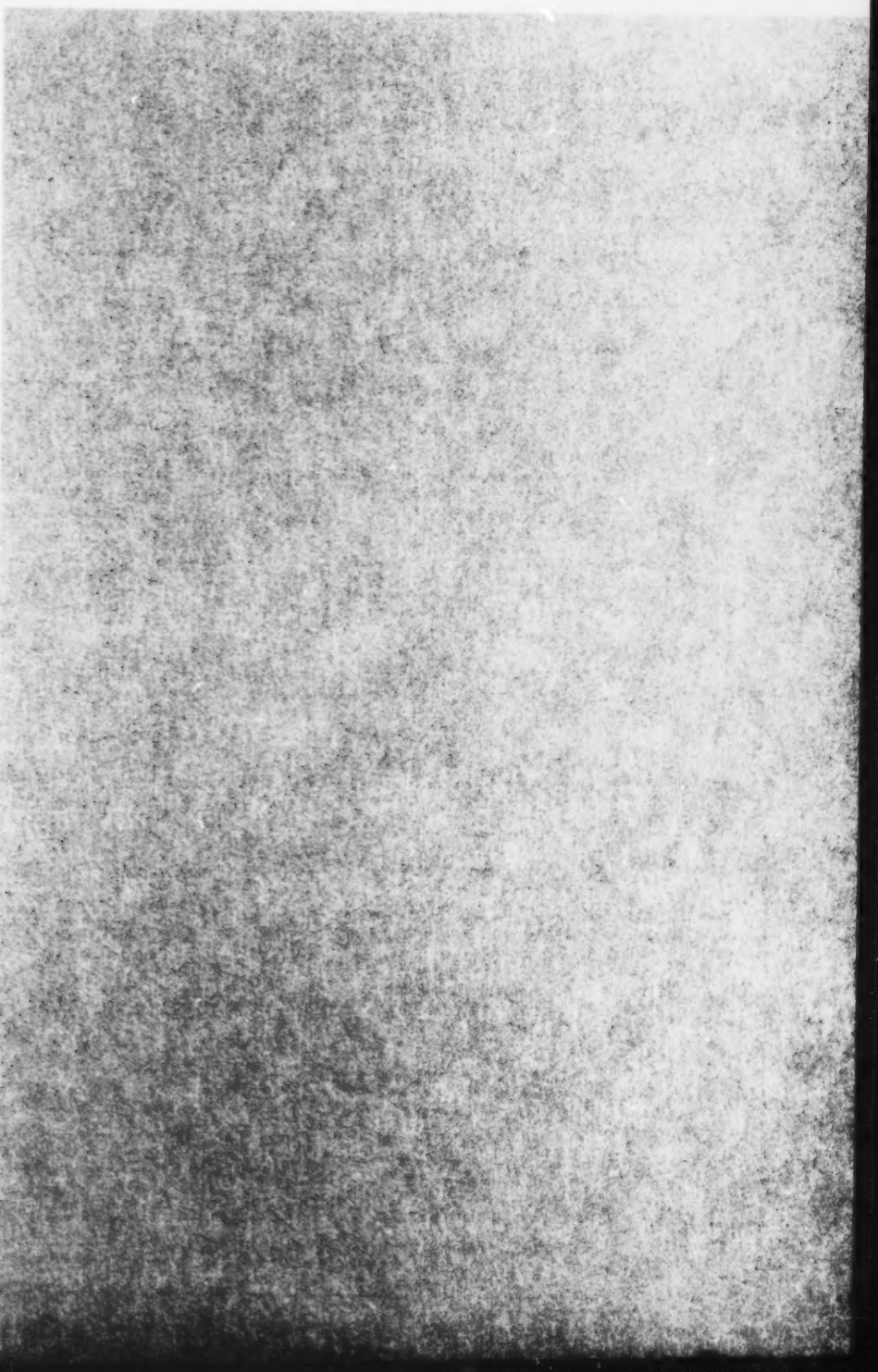
Saskatchewan Agriculture

Soils and Crops Branch

Insect Control in Field Crops 1989



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General

This publication contains the 1989 recommendations for insect control on cereals (wheat, barley, oats, rye), oilseeds (canola, mustard, flax, sunflowers), forages (alfalfa, sweetclover) and pulses (peas,and lentils).

The information contained in this publication does not supersede the information contained on the product's label. Should there be a discrepancy between the recommendation summaries in this publication and that provided on the product's label, the label recommendations should be adhered to.

Insecticide recommendations are based on those established by the Western Committee on Crop Pests and the Saskatchewan Advisory Committee on Crop Protection. Recommended insecticides have been selected on the bases of their effectiveness, cost and safety, and are not intended to be a comprehensive list of registered insecticides. Other insecticides may be used, provided the product label carries a recommendation for the control of the insect on that specific crop.

The information within the publication is arranged alphabetically by insect with a brief comment on the insect's life cycle and procedures that may assist in its control. A more detailed description of an insect's life cycle may be obtained from, The Guide to Farm Practice and or Insect Pests of the Prairies.

Insect forecasts and surveys are conducted annually by Saskatchewan Agriculture for a number of insects to monitor changes in their populations from year to year. These surveys provide a preliminary indication of whether or not a potential for an outbreak exists and the general area of the province that is most likely to be affected by those pests.

Since insect populations are affected by weather factors, parasites, predators, diseases, and the cultural practice employed by producers of these crops, it is extremely difficult to accurately predict changes in insect populations over large areas. When interpreting insect forecasts, it is important to recognize that the forecasts are not for individual fields and that these predictions are subject to considerable change depending upon variables which may either intensify or diminish the forecast considerably.

The results of these surveys can be obtained by contacting your local Extension Agrologist (Ag. Rep.)

Field inspections are an essential part of preventing insects from destroying crops. Visual inspections of crop from a distance often fails to detect insect infestations until the insects have already caused substantial damage to crops.

Once a potential insect problem is identified, it may require that an insecticide be applied to prevent substantial crop damage. Whenever possible, this guide indicates the insect population level where economic damage is likely to occur and the application of insecticides should be considered.

USING INSECTICIDES

Insecticide Toxicity

Insecticides are substances that have been selected for their ability to kill insects. They do so by interfering with an insect's vital life processes. Unfortunately, many of these insecticides are not very selective and may cause similar effects on other animals including man if undue exposure occurs. Such effects may occur as a result of a single exposure or from repeated exposure to small quantities that may have cumulative effects.

When handling insecticides, extreme caution should be taken to prevent exposure through prolonged contact with the skin, inhalation, or ingestion by mouth.

An insecticide's toxicity is usually expressed in terms of a single dose which if ingested orally or applied to the skin, will result in the death of half of the animals to which it is given. This value is referred to as the LD_{50} of the insecticide. The smaller the LD_{50} value, the more toxic the insecticide is.

This toxicity is expressed symbolically on every insecticide container with a skull and crossbones enclosed within one of the traffic symbols used to denote danger, warning, or caution.

Figure 1. Symbol used to denote extremely toxic substances.

The danger symbol enclosing the skull and cross bones (figure 1) indicates that if seven drops to one ounce of the insecticide is swallowed or if seven drops to three ounces are absorbed through the skin it could be fatal to a person weighing 150 pounds. When using insecticides bearing this symbol, full protective clothing including a respirator, goggles, rubber gloves, and protective clothing should be worn .

Figure 2. Symbol used to denote moderately poisonous substances.

The warning symbol enclosing the skull and cross bones (Figure 2) indicates that if one to three ounces of insecticide are swallowed or if three to seven ounces are absorbed by the skin; these levels of exposure could be fatal to a person weighing 150 pounds. When using insecticides bearing this symbol, full protective clothing including goggles, rubber gloves, and protective clothing should be worn.

Figure 3. Symbol used to denote slightly poisonous substances.

The caution symbol enclosing a skull and cross bones indicates that if three to eight ounces of insecticide are swallowed or if seven to 16 ounces are absorbed by the skin; this level of exposure could be fatal to a person weighing 150 pounds. When using an insecticide bearing this symbol protective clothing including rubber gloves should be worn.

The absence of a hazard symbol on

an insecticide label indicates that the material has an extremely low toxicity to mammals. Nevertheless protective clothing should be worn when using it.

Steps to chemical safety

The first step to the safe use of insecticides comes with the realization that insecticides are hazardous materials and their improper use may have serious consequences. When using insecticides always:

(1)**Read the Label** - Insecticides should not be used until the information on the label has been read and understood. If the label is missing or incomplete, do not use the insecticide. Every direction on the label should be carefully followed.

The label contains the following information:

- the name and amount of the toxicant,
- procedures to be followed while handling,
- a warning symbol indicating the appropriate human toxicity,
- crops which can be treated,
- volume of water to be applied,
- preharvest intervals,
- directions for storage,
- directions for container disposal,
- and the antidote in case of poisoning.

(2)**Obtain and Use Proper Protective Clothing** - Insecticides should be handled with extreme caution. It is essential that the appropriate safety equipment be worn.

When handling insecticides you should wear a clean long-sleeved shirt and long-legged trousers, a coverall-type of garment (preferably of the slash resistant or rubberized type) a hat, rubber gloves, and a respirator containing cartridges designed for use with organic pesticides, bearing the N.I.O.S.H. Code No. TC-23C.

To receive the maximum benefit from the protective equipment:

- Trouser cuffs should be worn over the rubber boots and the cuffs of the rubberized gloves should be turned back.
- The applicator should be clean shaven.
- Respirators should be cleaned after use in soapy water.
- The cartridges in the respirator should be replaced after about <u>eight hours of use or sooner if pesticides odour is detected .</u>

Frequently, respirators are not properly used. Respirators will not be effective in protecting the applicator from toxic fumes unless they contain the appropriate cartridges and are used properly.

The cartridges supplied with the respirator should be those that are approved for use with organic vapours. Cartridges with a N.I.O.S.H. Code No. TC-23C should be the only cartridges used. Cartridges without this code number will not provide adequate protection.

(3)**Mix and Handle Insecticides Carefully** - The greatest exposure to insecticides occurs during the mixing, loading and handling process. Before mixing insecticides always read the label instructions and wear appropriate protective clothing.

- Persons using insecticides should be prepared for an accident by making sure that soap, water and towels are available at the loading site.
- Aerial applicators should never take part in mixing and loading operations and should stand well away from the area where they are taking place.
- Insecticides should always be mixed outdoors in a place where there is adequate lighting, good ventilation and any possible spills can be cleaned up.

- When pouring insecticides, stand up wind to avoid contaminating yourself.

- Insecticide cans should be held so the spout is at the top. This will help to avoid the splashing and spurting of insecticides while emptying the containers. If the container has an air vent, use it.

- When containers of insecticide are empty, they should be rinsed at least three times and emptied into the sprayer tank.

- If you feel ill while using insecticides, stop work immediately and seek medical attention if necessary.

- Contaminated clothing should be changed immediately.

(4)Minimize Insecticide Drift - Effective and safe application requires that the insecticide contact the insect. To ensure that results are not erratic, it is necessary that insecticides do not drift away from the target area. The factors that affect insecticide drift include wind, droplet size, temperature and the distance between the nozzles and the target area. Insecticide drift can be reduced by:

- applying insecticides only when the wind speed is less than 11 km/h (7 mph).

- applying insecticides during early morning or late evening to reduce possible evaporation of the spray and resulting vapour drift.

- placing the spray nozzles at distances above the target that give adequate coverage.

(5)Dispose of Containers and Clean Up Spills - Information on chemical disposal and cleanup can be obtained from Saskatchewan Environment, 3085 Albert Street, Regina, Saskatchewan, S4S OB1, Phone 787-6181. In the event of a spill, call the Spill Report Centre, 1 or 112-800-667-7525 (24 hour, toll free).

(6)Decontamination of Equipment - Spray equipment and personal equipment should be decontaminated immediately after use.

- The sprayer tank should be rinsed with adequate water volume and the tank contents sprayed on the field or emptied carefully to ensure that the residue does not contaminate wells, or endanger the health of animals.

- Rubber gloves should be rinsed in water before proceeding with the removal of other safety equipment.

(7)Decontaminate Yourself - The last step in a spray operation is to remove contaminated clothing, shower with adequate amounts of soap and water and put on clean clothing.

EMERGENCY RESPONSE IN CASE OF AN ACCIDENT
Regina 359 - 4545
Saskatoon 966 - 1010

For additional information on using and handling pesticides, refer to the publication Pesticide Safety Handbook.

Alfalfa weevil

Alfalfa weevil is not a serious pest throughout Saskatchewan. The only recent reports of it causing damage to alfalfa have been from south-western Saskatchewan in irrigated alfalfa fields near Maple Creek.

The insect's life cycle begins with the emergence of the adult beetles during late summer. The adult weevil overwinters under grass or debris within the field or in the crowns of the alfalfa plants. In the spring, the adult beetles become active again and seek out suitable sites in which to lay their eggs. The stem of the plants are punctured and the eggs are inserted into the stem. During severe infestations, this may cause serious damage to the alfalfa if the punctures are numerous.

Upon hatching, the young larvae feed for three or four days within the stem and then move up the outside of the plant to feed on the developing leaf buds at the tip of the plant. As the larvae mature they may feed extensively, skeletonizing the leaves.

Control In hay fields, it is sometimes possible to control the damage by harvesting the first cut of hay, rather than by applying insecticide.

Insecticides should be applied in hay fields if there are 56 larvae per stem and in seed fields when there are 20 to 30 larvae per sweep or 35 to 50 per cent of the foliage tips show evidence of having been fed upon.

Insecticide	crop	Preharvest interval	Rates & Comments
Cygon 480 EC dimethoate	alfalfa	2 days	172 mL/ac. of product in sufficient water for adequate coverage using ground or aerial equipment. Population suppression only. Repeat only when necessary.
Decis 5.0 EC deltamethrin	seed alfalfa only		81 - 101 mL/ac. of product in 40 to 121 L of water per acre applied with ground equipment. Do not make more than one application per year. Do not apply at air temperatures above 25°C.
Furadan 480 F carbofuran	alfalfa	7 days	223 mL/ac. of product in at least 40 L of water per acre applied with ground equipment or in 20 L of water when applied with aerial equipment. Remove all felt filters, use 50 mesh (0.3 mm) or coarser screens and agitate the tank mixture.

Guthion 240 SC azinphos-methyl	alfalfa	21 days	910 - 1417 mL/ac. of product in 32 to 80 L of water per acre applied with ground equipment or in at least 16 L of water per acre when applied with aerial equipment.
Laygon 480 EC dimethoate	alfalfa	7 days	405 - 506 mL/ac. of product in sufficient water for good coverage. Aerial application is permitted. Do not graze within 28 days when applied at the highest rates.
Malathion 500 EC malathion	alfalfa	7 days	810 - 1130 mL/ac. product in at least 40 L of water per acre applied with ground equipment or in at least 8 L of water per acre when applied with aerial equipment. Do not apply at air temperatures below 20°C.
Sys-tem 480 EC dimethoate	alfalfa	2 days	172 mL/ac. of product in at least 20 L of water per acre applied with ground equipment or in at least 8 L of water when applied with aerial equipment.

Aphids - various species

Aphids may be found feeding upon cereals, oilseeds, forages and special crops during the summer. The damage they cause to these crops may vary considerably depending on how numerous the aphids are, the particular growth stage the plant is in and whether the aphids inject a toxin into the plant or transmits certain plant diseases.

Generally, those aphids that can overwinter in the Canadian Prairies rarely become numerous until late June or July, and do not usually constitute a serious problem to crops. An exception to this rule is the Russian wheat aphid which may cause significant crop damage throughout the growing season.

Control - Most aphids tend only to be a problem when large populations migrate into Saskatchewan from the United States very early in the spring. Frequently, the use of insecticides can be avoided if crops are seeded early. Early seeded crops tend not to be as heavily infested because they are not as attractive to the aphids and they often mature before aphid populations peek.

Insecticide application to control aphids varies considerably from one aphid species to another depending upon the growth stage of the affected plant and whether or not the aphid is one that injects a toxin into the host plant or transmits a plant disease. The economic thresholds suggested for the aphids species most frequently observed in Saskatchewan field crops are as follows:

Bird cherry-oat aphid (on cereals)- 70 or more aphids/tiller prior to the boot stage on cereals. In canary seed, 30 or more aphids/tiller between heading and the soft dough stage has been suggested as the level at which insecticides should be applied but data are not available to support or refute this opinion.

Cabbage aphid (on canola)- thresholds not established.

Corn leaf aphid (on cereals) - 50 or more aphids/plant prior to the boot stage.

English grain aphid (on cereals) - 70 or more aphids/tiller prior to the boot stage.

Green bug (on cereals) - 20 to 30 aphids/plant in the seedling stage or 50 more aphids/plant prior to the boot stage.

Pea aphid (on peas) - 7 to 10 aphids/20 cm of plant tip and flowers have begun to drop.

Potato aphid (on flax) - thresholds not established.

Russian wheat aphid (on cereals) - five to 10 percent of plants infested prior to the boot stage, 10 to 20 percent of the plants infested during the boot to early flowering or more than 20 percent of the plants infested after flowering are suggested; based on U.S. data.

Insecticide	crop	Preharvest interval	Rates & Comments
Cygon 480 EC dimethoate	alfalfa	2 days	111 - 172 **mL/ac.** of product on peas, 172 **mL/ac.** of product on alfalfa, 202 **mL/ac.** of product on canary seed or 344 - 346 **mL/ac.** of product on canola applied in sufficient water for good coverage using ground or aerial equipment.
	barley	7 days	
	canary seed	21 days	
	canola	28 days	
	oats	7 days	
	rye	7 days	
	wheat	7 days	
Laygon 480 EC dimethoate	peas	3 days	111 - 172 **mL/ac.** in sufficient water for adequate coverage. Aerial application is permitted. Do not graze or feed to livestock for 28 days.
Malathion 500 EC malathion	barley	7 days	607 - 1113 **mL/ac.** of product on cereals or 566**mL/ac.** of product on canary seed applied between heading and the soft dough stage. Applied in sufficient water for adequate coverage. Do not apply at air temperatures below 20°C.
	canary seed	14 days	
	oats	7 days	
	rye	7 days	
	wheat	7 days	
Sys-tem 480 EC dimethoate	alfalfa	2 days	172 **mL/ac.** of product applied at least 20 L of water per acre applied with ground equipment or in at least 8 L of water when applied with aerial equipment. Do not graze or feed to livestock for 28 days.
	barley	7 days	
	oats	7 days	
	peas	3 days	
	rye	7 days	
	wheat	7 days	

armyworms

Armyworms are occasional pests of cereals and flax. They migrate into Saskatchewan annually in June from the United States and infest cereal crops. Occasionally, they may also cause minor damage to flax crops but only after they have become established on volunteer cereals or wild oats within the crop.

Control - Damage caused by this insect is largely dependant upon the number of moths that deposit their eggs on a crop.

In cereals, the insect causes economic losses primarily by feeding upon the leaves of the crop but head clipping occurs occasionally and can be cause extensive loses.

To estimate armyworm densities, field inspections should occur in late June or early July especially in areas where the crop has lodged. Fields should be inspected for larvae in the early morning or evening by beating the crop to dislodge the pale green or green and brown striped larvae and then count the number of larvae that are dislodged from the plants. It is important to search carefully for the dislodged larvae since during the day they frequently hide under debris, lumps of soil, and leaves. Initially, the larvae feed primarily on leaves but as these are eaten they may clip stems just below the seed head.

Insecticides should be applied if there are 10 or more larvae per meter^2 in cereals. Economic thresholds have not been established for armyworms in flax.

Insecticide	crop	Preharvest interval	Rates & Comments
Dylox 420 L trichlorfon	barley oats wheat	21 days 21 days 21 days	**607 mL/ac.** of product applied in at least 20 L of water per acre applied with ground equipment or in at least 4 L of water per acre when applied with aerial equipment.
Lannate 480 L methomyl	barley oats wheat	21 days 21 days 21 days	506 - 911 **mL/ac.** of product in 40 to 142 L of water per acre applied with ground equipment or in 16 L of water per acre when applied with aerial equipment.
Malathion 500 EC malathion	barley oats rye wheat	7 days 7 days 7 days 7 days	450 - 1100 **mL/ac.** of product in at least 20 L of water per acre applied with ground equipment or in 8 L of water per acre when applied with aerial equipment. Do not apply at air temperatures below 20^{0}C.
Sevin liquid suspension carbaryl	barley oats rye wheat	14 days 14 days 14 days 14 days	1113 - 2226 **mL/ac.** of product applied in sufficient water to ensure thorough coverage. Aerial application permitted. **Use 50 mesh (0.3 mm) or coarser screens. Remove all felt filters and agitate tank mixture.**

Sevin XLR carbaryl	barley oats rye wheat	14 days 14 days 14 days 14 days	1012 - 2125 mL/ac. of product applied in sufficient water to give adequate coverage. Where wash off resistance is desirable, dilutions greater than 1:11 are not recommended. Aerial application is permitted. **Use 50 mesh (0.3 mm) or coarser screens. Remove all felt filters and agitate tank mixture.**

Barley Thrips

Barley thrips are a minor pest of barley, rye, and durum wheat. They overwinter as adult females on Kentucky blue grass and bromegrass around shelterbelts and bluffs. In late May or early June, they feed upon native grasses migrating into barley fields from mid June to early July.

Damage to the crop is caused by the thrips rasping the inner surface of the terminal leaf sheath causing yellowing of the leaves and a loss in yield and the percentage of plump kernels. Infested heads of grain may become trapped in the leaf sheath and exhibit a typical "goose neck" appearance.

Control - Insecticide application to control barley thrips does not appear to be warranted in most situations. However, conclusive data are unavailable at this time.

Insecticide	crop	Preharvest interval	Rates & Comments
Cygon 480 EC dimethoate	barley oats	28 days 28 days	404 mL/ac. of product applied in sufficient water to obtain good coverage, (usually 45 to 111 L per acre) with ground equipment.
Malathion 500 EC malathion	barley	7 days	450 mL/ac. of product applied in at least 20 L of water per acre applied with ground equipment or 8 L of water per acre when applied with aerial equipment. Do not apply at air temperatures below 20°C.
Sys-tem 480 EC dimethoate	barley	28 days	404 mL/ac. of product applied in at least 20 L of water per acre applied with ground equipment or in 8 L of water per acre when applied with aerial equipment.

Beet Webworm

Beet webworm is an occasional pest of canola, mustard, and peas and a serious pest of sugar beets. It has one generation per year, beginning with the emergence of the moths in early June. The larvae are dark green with two yellow stripes and are normally observed feeding in July and August upon canola or various weeds within the crop.

Control - To reduce crop damage caused by beet webworm, weeds in and around susceptible crops should be removed to reduce the attractiveness of the field to egg-laying females.

Insecticide application to control beet webworm in crops other than beets and peas does not appear to be warranted but data to establish economic thresholds are unavailable.

Insecticide	crop	Preharvest interval	Rates & Comments
Dylox 420 EC trichlorfon	canola	21 days	607 mL/ac. of product applied in sufficient water to provide adequate coverage. Application with aerial equipment is permitted.
Lannate 480 L methomyl	canola	8 days	506 - 911 mL/ac. of product applied in at least 40 L of water per acre when applied with ground equipment or in at least 16 L of water per acre when applied with aerial equipment.

Bertha armyworm

Bertha armyworm is a sporadic but serious pest of canola (rape seed) and mustard. It has one generation per year which begins with the emergence of the adult moth about the middle of June. After mating the female lays the eggs in clusters on the underside of leaves. The larvae vary considerably in their coloration from green to brown or black as they mature.

Control - Larval densities in canola are determined by beating the crop to dislodge the larva and counting the number of larvae per m^2. When estimating larval densities, it is important to inspect under leaves and any other plant debris since these larva frequently hide in leaves during the day. Usually, the crop can tolerate a considerable number of larvae without significant crop damage provided the plants have adequate leaf material for the larvae to feed upon.

Insecticides should be applied once there are approximately 20 to 30 larvae per m^2 or as soon as soon as the larvae begin to feed on seed pods.

Insecticide	crop	Preharvest interval	Rates & Comments
Decis 5.0 EC deltamethrin	canola mustard	14 days 14 days	40 - 61 mL/ac. of product applied in 5 to 9 L of water per acre applied with aerial equipment.

			Apply only once per season. Do not apply at air temperatures above 25°C.
Lannate 480 L methomyl	canola flax	8 days 8 days	346 - 506 mL/ac. of product applied in at least 40 L of water per acre applied with ground equipment or in at least 16 L of water per acre when applied with aerial equipment.
Lorsban 4E chlorpyrifos	canola	21 days	303 - 405 mL/ac. of product applied in 20 to 80 L of water per acre applied by ground equipment or 4 to 12 L per acre when applied with aerial equipment.
Monitor 480 L Metha- dimidaphos	canola	10 days	233 - 506 mL/ac. of product applied in 80 to 400 L of water per acre applied with ground equipment or 4 L of water per acre when applied with aerial equipment.

Blister beetles

Blister beetles are sporadic pests of forages, canola, faba beans, and a variety of other crops.

The life cycle begins with the emergence of the adult beetles in June. Upon emergence, the beetles may invade cultivated crops and are initially concentrated around the perimeter of the affected crops giving the appearance of their being extremely abundant. The adults mate and deposit their eggs. The larval stage of the blister beetles prey upon the eggs of grasshoppers and the larvae of solitary bees.

The Nuttall blister beetle is the largest of the blister beetles and the one most frequently reported feeding on cultivated crops in Saskatchewan. The adult beetle is 0.65 to 1.1 inches in length and metallic green and purple in colour.

Control - Insecticide application to control blister beetles in most situations does not appear to be warranted. It is recognized that blister beetles may cause significant damage to faba beans by feeding upon the flowers and the terminal growing point of the plant but data to establish economic thresholds are unavailable.

Insecticide	crop	Preharvest interval	Rates & Comments
Sevin liquid suspension carbaryl	alfalfa clover	0 days 0 days	1113 - 1720 mL/ac. of product applied in sufficient water to ensure through coverage (18.2 to 182 L per acre depending upon application equipment, degree of infestation, and stage of the crop growth.) Aerial application permitted.
Sevin XLR carbaryl	alfalfa clover	0 days 0 days	1012 - 1619 mL/ac. of product applied in sufficient water to give

adequate coverage. Where wash off resistance is desirable, dilutions greater than 1:11 are not recommended. Aerial application is permitted.

Clover cutworm

Clover cutworm is an occasional pest of cereals, oilseeds, pulse crops, and forages. It has been observed feeding on barley, fall rye, mustard, canola, flax, peas, and a variety of weeds including Russian thistle and kochia.

The life cycle begins in the spring with the emergence of the adult moths, which mate and lays their eggs singly on the appropriate host plants. The eggs hatch and the larvae begin feeding. These larvae may vary considerable in their coloration as they develop and are often improperly identified as Bertha armyworm by the casual observer.

Clover cutworm can be distinguished from Bertha armyworm by the presence of a broad yellowish-pink stripe along each side of the larva and the presences of a pair of black dashes on each larval segment above this stripe. The dashes are visible along the back of the larva. When mature, the larvae may be up to 1.29 inches long. They then enter the soil and pupate. Two or three generation are possible if the growing season has been long and hot.

Control - Insecticide application to control clover cutworm in canola or mustard should be considered when there are 20 to 30 larvae per meter^2 or as soon as pod damage is observed. In flax, the thresholds are likely to be significantly lower since the larvae frequently clip the flax stem just below the boll.

Note: Economic thresholds have not been established specifically for this insect in Canada, but because of its similarity in size and behaviour with the Bertha armyworm similar thresholds are considered relevant until experimental data are available.

Insecticide	crop	Preharvest interval	Rates & Comments
Decis 5.0 EC deltamethrin	canola mustard	14 days 14 days	40 - 61 mL/ac. of product applied in 5 to 9 L of water per acre using aerial equipment. Do not apply more than once per season. Do not apply at air temperatures above 25°C.
Lannate 480 L methomyl	canola	8 days	346 - 506 mL/ac. of product applied in at least 40 L of water per acre when applied with ground equipment or in at least 16 L of water per acre when applied with aerial equipment.

Cutworms

Cutworms are a serious pest of crops in Saskatchewan. Cutworms overwinter either as eggs or as very small larvae. Crop damage begins within days of crop emergence in spring-seeded cereals and is often most visible first on elevated areas within the fields.

Army cutworms may be a significant problem in fall-seeded cereals and spring crops seeded before the end of May. They feed above the soil surface but hide under soil debris during the day. Check for army cutworms and feeding damage on volunteer cereals and weeds before seeding and delay seeding until late May.

Pale western and red-backed cutworms cause most of their damage from early June to mid-July in Saskatchewan. The species most often responsible for crop damage is the pale western cutworm. This cutworm is a crop pest only in the more arid regions of the province. It is a frequent crop pest in fields south of a line drawn from Kerrobert through Saskatoon to Broadview.

Control - Moth populations are monitored annually to determine changes in the abundance of cutworms. This forecast indicates only the relative changes in the population and currently is not reliable enough to predict which field will be infested with cutworms each year. Crops should be inspected frequently during May and June. Looking for notches on leaves and for wilted, severed or missing plants. Cutworm larvae will normally be found below the soil surface and within several inches of the damaged plants. Use a shovel or garden trowel and a soil-sifting screen to determine the number of cutworm larvae present.

In most situations, problems from these cutworms can be minimized by ensuring the summerfallow is kept free of weeds and the soil is allowed to form a crust between mid August and mid September when the cutworm moths are laying their eggs. Insecticides should be applied when there are 3 or 4 larvae per m^2 in cereals. Lower densities may cause significant damage in oilseed crops.

Insecticides should be applied in the evening, and the soil surface remain undisturbed for at least five days. Where rate ranges are given, the higher rates should be used when cutworms are extremely abundant, larvae are nearing maturity or large, or the soil conditions are dry. **NOTE: Under dry soil conditions insecticides may not give adequate control.**

Producers who wish to review basic information on cutworms and their control may wish to preview the film entitled, Pale Western cutworm.

Insecticide	crop	Preharvest interval	Rates & Comments
Ambush permethrin	barley canola flax lentils oats peas rye sunflower wheat		57 - 121 mL/ac. of product applied in sufficient water for good coverage. Aerial application is permitted.
Decis 5.0 EC deltamethrin	Barley flax lentils oats	40 days 40 days 40 days 40 days	80 mL/ac. of product applied in at least 40 L of water per acre applied with ground equipment or in 5 to 9 L of water per acre when applied with

	wheat	40 days	aerial equipment. Do not graze or feed treated crop to livestock. Apply only once/season. Do not apply at air temperatures above 25°C.
Lorsban 4E chlorpyrifos	barley canola flax oats sunflower wheat	60 days 21 days 21 days 60 days 90 days 60 days	354 - 486 mL/ac. of product in 20 to 80 L of water per acre applied with ground equipment or in 4 to 12 L of water per acre when applied with aerial equipment. Do not apply more than once/season.
Pounce permethrin	barley oats rye wheat	Do not apply after 5 leaf stage.	73 - 157 mL/ac. of product per acre applied in sufficient water to give adequate coverage. Aerial application permitted in 5 to 14 L of water per acre. Do not apply within 15 meters of productive fisheries' water or waterfowl habitats when using ground equipment or within 100 meters when using aerial equipment

Diamondback moth

Diamondback moth is an occasional, but often serious, pest of canola and mustard.

The annual infestation begin when the adult moths arrive with weather systems from the southern United States. Eggs are laid on the upper and lower surface of the leaves of the canola and mustard plant. After hatching, the larvae burrow into the leaf and begin to feed on cells within the leaf. As a larva grows, it begin to feed on the entire leaf, and may eventually feed on flower petals, flower buds, and seed pod of the plant.

Larvae vary slightly in coloration from green to greenish-yellow to yellowish-brown depending upon what portions of the plant they have been feeding upon. When mature, they are about 0.5 inches long and pupate within a loose, lacy cocoon on stems, leaves or seed pods of the plant.

The adult moth emerges within about a week and starts the life cycle over again. There maybe several generation a year with peaks in the adult populations being as close as 21 days apart.

Control - Insect densities may be determined by beating infested plants on a hard surface to dislodge the larvae or collecting them in a sweep net. The number of larvae per sweep is considered to be approximately equal to the number of larvae per meter^2.

Insecticides should be applied to control the larval stage of the insect once there are 200 to 300 larvae per meter^2. Lower infestation levels may be considered when plants are stressed or dying.

Insecticides	Crop	Preharvest interval	Rates & Comments
Decis 5.0 EC deltamethrin	canola mustard	14 days 14 days	40 - 60 mL/ac. of product applied in 5 to 9 L of water per acre applied with aerial equipment. Do not apply more than once per year. Do not apply at air temperatures above 25°C.
Dylox 240 SC trichlorfon	canola	21 days	1113 mL/ac. of product applied in sufficient water to ensure complete coverage. Aerial application is permitted.
Guthion 240 SC azinphos-methyl	canola	30 days	223 - 506 mL/ac. of product in sufficient water for complete coverage.
Malathion 500 EC malathion	canola	7 days	242 - 324 mL/ac. of product in at least 20 L of water per acre applied with ground equipment or in 4 L of water per acre when applied with aerial equipment. Do not apply at air temperatures below 20°C.
Supracide 25 EC methidathion	canola	30 days	404 mL/ac. of product applied in at least 44 L of water per acre when applied with ground equipment or at least 9 L of water per acre when applied with aerial equipment.

Flax bollworm

Flax bollworm is an infrequent pest of flax.

The life cycle begins with the emergence of the adult moth in the spring. Eggs are deposited onto the flax plant and a slender green larva with four conspicuous white or yellowish-white stripes emerges and penetrates into the developing boll. Within the boll, the developing larva feeds upon the developing flax seeds. Infested bolls gradually turn brown as the seeds within are consumed by the developing larva. Infested bolls usually stand out clearly among the uninfested green bolls. Often, this is the first indication of an infestation. When fully developed, the 1.5 inch larva enters the soil and pupates. There is only one generation per year.

Control - Insecticide application is recommended when three percent of the flax bolls are infested.

Insecticides	crop	Preharvest interval	Rates & Comments
Lannate 480 L methomyl	canola flax	8 days 8 days	364 - 506 mL/ac. of product applied in at least 40 L of water per acre when applied with ground equipment or in at least 16 L of water per acre when applied with aerial equipment.

Flea beetles

Flea beetles are an annual pest of canola and mustard.

Their life cycle begins with the emergence of the adult beetles the previous fall. The beetles feed extensively on the leaves and seed pods of canola mustard and other cruciferous plants then overwinter beneath grass and debris around the fields and the leaf litter beneath trees and shrubs. In the spring, the adult beetles migrate to the field and attack the emerging seedlings. Eggs are deposited at the base of the plant and the larvae feed on the roots of the crop. Adult beetles emerge again in August to resume the life cycle.

Control - Insecticides are applied either as a seed dressing or as an in-furrow granule at planting. These insecticides provide some protection to the seedlings for the first several days after emergence. However, if the flea beetles are abundant or the plants are growing under drought conditions a foliar application of insecticide may be necessary if 25 percent of the surface area on the cotyledons is destroyed.

Damage to the nearly mature crop in the fall does not seem to warrant the use of insecticides unless it appears that the seed pods are going to be severely debarked. However, conclusive data are not available to establish what level of seed pod damage is of economic significance.

Seed treatments

Insecticides	Crops	Preharvest interval	Rates & Comments
Benolin-R lindane 50% thiram 10% benomyl 6%	canola	planting time seed treatment only.	800 g of product/25 kg of seed. DO NOT use on soil in which edible root crops (except rutabagas and turnips) are to be planted in the same season. Unused, treated seed must be labelled as follows: Poisonous to man and animals. This seed has been treated with lindane, benomyl and thiram. Do not use as food or feed, nor process seed for oil.
Counter 5G terbufos	canola	planting time seed treatment only.	2.2 - 4.5 kg of product per acre of seed sown. The higher rates should be used when using a discer or air seeder to plant the seed or if extreme infestations are anticipated.

			Adjust seeding rates to sow the combined weight of the seed and insecticide.
Thiram Plus lindane 75% thiram 10% benomyl 6%	canola	planting time seed treatment only.	**750 g of product/25 kg of seed.** DO NOT use on soil in which edible root crops (except rutabagas and turnips) are to be planted in the same season. Unused, treated seed must be labelled as follows: Poisonous to man and animals. This seed has been treated with lindane, benomyl and thiram. Do not use as food or feed, nor process seed for oil.
Furadan CR 10 carbofuran	canola	planting time seed treatment only.	1.13 kg of product per acre of seed sown. Seed preferable with hoe or press drill. Do not use disc seeding equipment. Harrowing after seeding causes loss of efficiency. Adjust seeding rates to sow the combined weight of the seed and insecticide.

Foliar insecticides

Insecticides	Crops	Preharvest interval	Rates & Comments
Decis 5.0 EC deltamethrin	canola mustard	14 days 14 days	40 mL/ac. of product in 40 L of water per acre applied with ground equipment or 5 to 9 L of water per acre when using aerial equipment. Do not apply more than once per year using aerial equipment. Do not apply at air temperatures above 25°C.
Decis 5.0 F deltamethrin	canola mustard	14 days 14 days	40 mL/ac. of product in 40 L of water per acre applied with ground equipment or 5 to 9 L of water per acre when applied with aerial equipment. Do not apply more than once per year using aerial equipment. **Remove all felt filters, use 50 mesh (0.3 mm) or coarser screens and agitate the tank mixture.** Do not apply at air temperatures above 25°C.

Malathion 500 EC malathion	canola	7 days	445 mL/ac. of product in at least 20 L of water per acre applied with ground equipment or in at least 4 L of water per acre when applied with aerial equipment. Do not apply at air temperatures below 20°C.
Sevin XLR carbaryl	canola	28 days post-emergence	202 mL/ac. product applied in sufficient water to give adequate coverage. Where wash off resistance is required, dilutions of 1:1 to 1:11 are recommended.
Furadan 480 F carbofuran	canola mustard	60 days 21 days	60 - 111 mL/ac. of product applied in sufficient water to give adequate coverage. Aerial application permitted. Do not apply more than 111 ml of product per season. **Remove all felt filters, use 50 mesh (0.3 mm) or coarser screens and agitate the tank mixture.**

Grasshoppers - all species

Grasshoppers are a persistent pest of cereal, oilseed, forage and pulse crops in Saskatchewan.

The life cycle of the economically important species begins in May and continues until all the eggs have hatched, about the middle of June depending on the grasshopper species, soil type, vegetative cover, and weather conditions after the eggs were deposited. The grasshopper nymphs develop through several instars until they become adults during July. Mating and egg laying then proceeds until the end of the season. Grasshoppers may cause varying amounts of crop damage throughout the season. However, the most severe damage usually occurs shortly after hatching, when the crop is sparse, or when grasshoppers move into the crop from adjacent fields as pasture grasses become dormant, forage crops are harvested, and weeds are controlled on summer-fallow fields.

Control - The early destruction of annual weeds using herbicides or conventional tillage practices before grasshoppers emerge is the most effective way to control grasshoppers on summerfallow. In those areas where grasshoppers have emerged before the weeds are controlled or in forage crops being harvested for animal feed, grasshoppers can be controlled economically by using trap strips to concentrate them before applying an insecticide.

Insecticide recommendations are conditional upon the number of grasshoppers, the size of the affected plants and the general conditions under which the plants are growing. If the plants are small and growing under conditions that do not favour plant growth as few as three or four grasshoppers/m^2 may require chemical control. However, when large plants are growing under favourable growing conditions, control may not be warranted until there are seven to nine grasshoppers/m^2. It is important to note that if crop damage occurs before all the

grasshoppers have hatched, several applications of insecticide may be required to protect the crop adequately.

Insecticides	Crops	Preharvest interval	Rates & Comments
Cygon 480 EC dimethoate	alfalfa barley oats rye wheat	2-21 days 2-28 days 2-28 days 2-28 days 2-28 days	172 - 202 or 395 - 405 mL/ac. of product on cereals, 172 - 202 or 344 - 364 mL/ac. of product on forage crops or 344 - 364 mL/ac. product on canola in sufficient water for good coverage using ground or aerial equipment. Use lower rates only for very low infestations.
Decis 5.0 EC deltamethrin	barley flax lentils oats wheat	40 days 40 days 40 days 40 days 40 days	40 - 61 mL/ac. applied in 40 L to 81 L of water per acre applied with ground equipment or in 5 to 9 L of water per acre when applied with aerial equipment. Do not apply more than three times per year with a maximum of two applications per year with aerial equipment. Do not graze treated fields. Do not apply at air temperatures above 25°C.
Decis 5.0 F deltamethrin	barley flax lentils oats wheat	40 days 40 days 40 days 40 days 40 days	32 - 49 mL/ac. applied in 40 L to 81 L of water per acre applied with ground equipment or in 5 to 9 L of water per acre when applied with aerial equipment. Do not apply more than three times per year with a maximum of two applications per year with aerial equipment. Do not graze treated fields. Remove all felt filters, use 50 mesh (0.3 mm) or coarser screens and agitate the tank mixture. Do not apply at air temperatures above 25°C.
Furadan 480 F carbofuran	alfalfa barley clover corn flax mustard oats sunflower wheat	1 day 21 days 28 days 7 days 21 days 21 days 21 days 60 days 21 days	111 mL/ac. of product applied in at least 40 L of water per acre applied with ground equipment. Application with aerial equipment is permitted. Use sufficient water for adequate coverage. Do not apply more than once per season to flax, mustard, or canola

			nor more than twice per season to wheat, barley, oats, corn, pastures, alfalfa, sweet clover, roadsides or headlands.
Guthion 240 SC azinphos-methyl	alfalfa	1 days	445 - 709 mL/ac. of product in at least 32 L of water per acre applied with ground equipment or 16 L of water per acre when applied with aerial equipment. Do not apply more than once per season.
	barley	30 days	
	clover	21 days	
	oats	30 days	
	rye	30 days	
	wheat	30 days	
Hopper stopper dimethoate	barley	21 days	800 - 1200 g bran bait per acre broadcast evenly.
	oats	21 days	
	pasture		
	- beef	0 days	
	- dairy	2 days	
	rye	21 days	
	wheat	21 days	
Laygon 480 EC dimethoate	alfalfa	7 days	405 - 506 mL/ac. of product in sufficient water for good coverage. Aerial application permitted. Do not graze for 28 days when applied at the highest rate.
Lorsban 480 EC chlorpyrifos	barley	60 days	235 - 354 mL/ac. of product in 20 to 81 L of water per acre applied with ground equipment or 8 to 12 L of water per acre when applied with aerial equipment.
	canola	21 days	
	oats	60 days	
	wheat	60 days	
Malathion 500 EC malathion	alfalfa	7 days	445 - 708 mL/ac. of product in at least 20 L of water per acre applied with ground equipment or at least 4 L of water per acre when applied with aerial equipment. Do not apply at air temperatures below 20°C.
	barley	7 days	
	canola	7 days	
	clover	7 days	
	corn	7 days	
	flax	7 days	
	mustard	7 days	
	oats	7 days	
	pasture	0 days	
	rye	7 days	
	wheat	7 days	
Sevin liquid suspension carbaryl	alfalfa	0 days	607 - 1113 mL/ac. of product in sufficient water to ensure thorough coverage (18.2 to 182 L per acre depending upon application equipment, degree of infestation, and stage of the crop growth.) Aerial application permitted. **Remove all felt filters, use 50 mesh (0.3 mm.) or coarser screens, and agitate tank mixture.**
	barley	14 days	
	clover	0 days	
	oats	14 days	
	pastures	0 days	
	rye	14 days	
	wheat	14 days	

Sevin XLR carbaryl	alfalfa barley clover oats pastures rye wheat	0 days 14 days 0 days 14 days 0 days 14 days 14 days	506 - 1012 mL/ac. of product in sufficient water to give adequate coverage. Where wash off resistance is required, dilutions of 1:1 to 1:11 are recommended. Remove all felt filters, use 50 mesh (0.3 mm.) or coarser screens, and agitate tank mixture.
SYS-TEM 480 EC dimethoate	alfalfa barley oats rye wheat	7 days 7 days 7 days 7 days 7 days	172 - 344 mL/ac. of product in at least 20 L of water per acre applied with ground equipment, or 4 L of water per acre when applied with aerial equipment.

Lygus bug and various other plant bugs

Lygus bug and a variety of other plant bugs are serious pests of alfalfa grown as a seed crop. The lygus bug overwinters as an adult in leaf litter and debris associated with trees, shrubs and "wasteland" outside the alfalfa fields. The adults resume activity in the spring, mate, and lay eggs in the hollow stem of the alfalfa plants. The nymphs take approximately 30 days to mature and the new adults start to appear in the crop about the middle of July. These bugs attack the alfalfa when it is in the bud stage or early bloom causing the buds to shrivel and die.

Control - Crop damage can be minimized by burning of alfalfa stubble in the spring. This will control all plant bugs by destroying the overwintering eggs, except lygus bug, which does not overwinter within the crop.

Insecticide application is recommended when there is an average of one adult lygus bug per two sweeps or five nymphs or adults of other species per sweep net catch.

The control of lygus bug and other plant bugs in alfalfa grown for forage is not recommended.

Insecticides	crop	Preharvest interval	Rates & Comments
Cygon 480 EC dimethoate	alfalfa	2 days	172 mL/ac. product in sufficient water for good coverage using ground or aerial application equipment.
Decis 5.0 EC deltamethrin	seed alfalfa only		81 - 101 mL/ac. of product in 40 to 121 L of water per acre applied with ground equipment. Do not make more than one application per year. Do not apply at air temperatures above 25°C.

Dy ox 420 L trichlorfon	alfalfa	14 days	1113 mL/ac. of product in sufficient water to ensure through coverage. Only one application per cutting.
Lygon 480 EC dimethoate	alfalfa	7 days	405 - 506 mL/ac. of product in sufficient water for good coverage. Aerial application is permitted.
Sya-tem 480 EC dimethoate	alfalfa clover	7 days 28 days	172 mL/ac. of product in at least 40 L of water per acre applied with ground equipment or at least 8 L of water per acre when applied with aerial equipment.

Orange Wheat Blossom Midge

Orange wheat blossom midge is an annual pest of wheat in northeastern and east central Saskatchewan. Economically important infestations have been concentrated in an area north of a line drawn from Prince Albert to Yorkton.

The life cycle begins with the emergence of the adult midge about the last week of June. The midge mates and its eggs are deposited on heads of wheat. The larvae develop while feeding upon the developing seed. By August, larval growth is complete and the larva leaves the plant and forms a larval cocoon in the soil. It remains within this cocoon until conditions are favourable; sometimes this can be for several years.

Control - Forecasts are unavailable to predict which wheat field within the infested areas will be most heavily infested. However, distribution maps are available indicating the areas that have been infested and the general level of infestation.

To detect the presence of this insect in a wheat field, producers must inspect their crop every evening from the time the midge begins to emerge until the crop has flowered.

Insecticide application should be made if there are approximately one or more adult midge per four or five heads of wheat and 70 percent of the wheat heads have emerged from the "boot". Insecticides should be applied in the late afternoon or early evening when air temperatures exceed 15°C and when the wind velocity is less than 10 kmph.

Producers who wish to review basic information on the orange wheat blossom midge and their control may wish to preview the film entitled, "The Wheat Midge Problem" or obtain a fact sheet concerning this insect form their Extension Agrologist (AG. Rep.).

Insecticides	Crops	Preharvest interval	Rates & Comments
Cygon 480 EC dimethoate	wheat	21 days	405 mL/ac. of product in sufficient water to give adequate coverage using ground or aerial equipment.
Furadan 480 F carbofuran	wheat	21 days	111 mL/ac. of product in 20 L of water per acre applied with ground equipment. Application by aerial

			equipment is permitted. Use sufficient water to ensure through coverage.
Lorsban 4E chlorpyrifos	wheat	60 days	324 mL/ac. of product in 20 to 81 L of water per acre applied with ground equipment or in 4 to 12 L of water per acre when applied with aerial equipment.

Painted Lady Butterfly

Painted lady butterfly is an occasional pest of canola, mustard, and sunflowers.

There may be two or more generations per year once the butterfly arrives in Saskatchewan from the southern United States. The butterfly lays its eggs on a variety of plants including the above crops and a variety of weeds such as Canada thistle and round-leafed mallow.

The larva of this butterfly is sometimes referred to a thistle caterpillar because of its preference for Canada thistle as a host plant. The larva is black, spiny and up to 1.5 inches in length. Often, it will web the upper surface of the host plant's leaves together to protect itself from various predators and forages from within this protective webbing.

When mature, the larva attaches itself to the underside of a leaf or stem and forms a chrysalis and pupates. When development is complete the adult butterfly emerges from the chrysalis and the cycle continues until fall when the adults migrate south.

Crop damage caused by this insect is primarily related to the feeding activity of the larval stage but, the droppings left behind by the caterpillars is frequently harvested with mustard and canola and must be removed before the crop can be sent to market.

Control - Insecticide application may be warranted to control this insect on sunflowers but data is unavailable to establish what population levels warrant control.

Insecticides	crop	Preharvest interval	Rates & Comments
Guthion 240 SC azinphos-methyl	canola	30 days	460 mL/ac. of product applied in sufficient water for complete coverage. Aerial application is permitted.
Supracide 25 EC methidathion	canola	30 days	850 - 1133 mL/ac. of product in at least 45 L of water per acre applied with ground equipment or at least 9 L of water per acre when applied with aerial equipment.

Red Turnip Beetle

Red turnip beetle is an occasional pest of canola and mustard. The insect has one generation per year and overwinters in the egg stage under clumps of soil and debris. In, May the eggs hatch and the black, slow moving larvae feed on various cruciferous plants. Upon completion of the larval stage, the larvae enters the soil and pupate. The adult beetles subsequently emerges and resumes feeding.

Crop damage from this insect is primarily caused by the feeding activity of adult beetles as they invade the crop from adjacent fields. The damage usually occurs after the adults have consumed the volunteer canola and mustard or when these plants have been destroyed by cultivation or herbicides.

Control - Damage to canola and mustard crops can be minimized by (1) destroying volunteer cruciferous plants in the spring to starve the young larvae and (2) by not seeding canola adjacent to fields that have been heavily infested the previous year.

Insecticide application should be applied to crop margins as soon as beetles become numerous.

Insecticides	crop	Preharvest interval	Rates & Comments
Guthion 240 SC azinphos-methyl	canola	30 days	223 - 344 mL/ac. of product in sufficient water for complete coverage. Aerial application is permitted.
Furadan 480 F carbofuran	canola mustard	30 days 30 days	111 mL/ac. of product in sufficient water for complete coverage. Aerial application is permitted.
Supracide methadithion	canola	30 days	404 mL/ac. of product in 45 L of water per acre applied with ground equipment or in at least 9 L of water when applied with aerial equipment.

Sunflower Beetle

Sunflower beetle is a cream coloured beetle with dark brown stripes on its outer wing (the last stripe resembling an exclamation mark) and brown patch across its thorax. This beetle is often confused with the Colorado potato beetle.

The beetle has one generation per year. The eggs are laid singly on the stem of the plant or on the underside of the leaves. The eggs hatch within a week and the yellowish-green, humpbacked larvae begin feeding on the leaves and floral bracts during the night and hide in the bracts during the day. When mature, the larvae drop to the ground and pupate in the soil.

Control - Crop damage caused by this insect can be reduced with late fall cultivation which may expose beetles to the elements and cause greater winter mortality.

Insecticide application is recommended when there is 1 adult beetle per two or three seedlings at the two to six leaf stage in June or

10 or more larvae per plant during the summer.

Insecticides	crop	Preharvest interval	Rates & Comments
Guthion 240 SC azinphos-methyl	Sunflower	see comments	445 mL/ac. of product in at least 32 L of water per acre. Do not apply more than twice per season nor after sunflower heads have formed.
Furadan 480 F carbofuran	sunflower	60 days	111 ml/ac. of product in at least 40 L of water applied with ground equipment. Do not apply after plants are more than 60 cm in height nor after heads have started to form. Aerial application not effective.
Decis 5.0 EC deltamethrin	sunflower	70 days	40 mL/ac. of product in 40 to 81 L of water per acre applied with ground equipment or 5 to 9 L of water per acre when applied with aerial equipment. Do not apply more than once per year. Do not apply at air temperatures above 25°C.
Thiodan 400 EC endosulfan	sunflower	60 days	570 mL/ac. of product in at least 20 L of water per acre applied with ground equipment or in 4 L of water per acre when applied with aerial equipment.
Supracide 25 EC methidathion	sunflower	50 days	405 - 850 mL/ac. of product in at least 45 L of water per acre applied with ground equipment or at least 9 L of water per acre when applied with aerial equipment.

Sunflower moths

Sunflower moth is an occasional pest of sunflowers. The moth migrates into Saskatchewan from the southern United States during early July.

Female moths deposit their eggs only in newly-opened sunflower blooms. The larvae hatch and feed on pollen and later move on to destroy developing seeds. Upon completion of the larval stage, they enter the soil, pupate and subsequently emerge in September.

Control - Insecticides should be applied to oilseed sunflowers if

moths are present (as indicated by pheromone traps) and at least 10 percent of the blooms opening. If high moth catches continues, a repeat application may be required at five day intervals.

Insecticides	crop	Preharvest interval	Rates & Comments
Supracide 25 EC methidathion	oilseed sunflower	50 days	850 - 1133 mL/ac. of product in at least 45 L of water per acre when applied with ground equipment or at least 9 L of water per acre when applied with aerial equipment.

Sweet Clover Weevil

Sweet clover weevil is a persistent pest of sweet clover. The adults emerge in late summer and feed extensively from mid-August until mid-September. The adults overwinter in leaf litter and debris around the field and reinvade the crop in the spring. Eggs are deposited at the base of the plants and the larvae feed and develop on the roots of the plant.

Control - Infestations can be reduced by (1) establishing new stands of sweetclover as far as possible from second-year sweetclover using high quality scarified seed, planted no deeper than 25 cm, to ensure quick germination, (2) cultivating second-year sweetclover immediately after it has been cut for hay or silage to destroy the larval and pupal stages prior to the emergence of the next generation adults.

Insecticides should be applied in first year stands if there is one weevil per three seedlings under normal conditions or one weevil per five seedlings under dry conditions.

In second year stands of sweetclover, insecticides should be applied if there are 9 to 12 weevils per plant.

Insecticides	crop	Preharvest interval	Rates & Comments
Cygon 480 EC dimethoate	clover	28 days	344 - 445 mL/ac. of product in sufficient water for good coverage using ground or aerial equipment.
Guthion 240 SC azinphos-methyl	clover	21 days	910 mL/ac. of product per acre in at least 32 L of water per acre applied with ground equipment or at least 16 L of water per acre when applied with aerial equipment. A second application is permitted at a 7 to 14 day interval.
Malathion 500 EC malathion	clover	7 days	570 mL/ac. of product in at least 40 L of water per acre applied with ground equipment or in at least 8 L of water per acre when applied with aerial equipment. Do not apply at air temperatures below 20°C.

System 480 EC dimethoate	clover	7 days	344 - 404 mL/ac. of product in at least 40 L of water per acre applied with ground equipment or in at least 8 L of water per acre when applied with aerial equipment.

Wireworms

Wireworms are a pest of cereal grains and grasses throughout Saskatchewan.

The life cycle begins with the emergence of the adult beetle in late July. It then overwinters in the soil and becomes active in the spring. Adults mate and lay eggs around the roots of grasses. The yellowish brown larvae spend two to six years in the soil feeding on the roots of grasses before pupating and completing their life cycle.

Field infestations usually take several years to develop unless the crop is seeded on land that has been previously under sod.

Crop damage is usually noticed shortly after seeding. Affected plants wither, wilt and die.

The stems of damaged plants appear as if they have been perforated or shredded rather than being severed as is the case when plants have been damaged by cutworms.

The wireworm larvae are not always present by the time the damage is noticed because the larvae move deeper into the soil as the season progresses and the soil becomes warmer and dryer .

Control - Crop damage from wireworms can be minimized by (1) including relatively immune crops such as flax or canola in rotation with cereals, (2) cultivating summerfallow fields as shallow as possible, (3) seeding cereal crops shallow to induce quick germination, and (4) using insecticide.

Cereals,planted into fields cropped continuously to cereals, newly-broken sod, summerfallow fields or fields with a previous history of wireworms, should be treated with insecticides for two consecutive years.

Insecticides	Crops	Preharvest interval	Rates & Comments
Mergamma M-N **Drill Box** lindane 18.75% & Maneb 37.5%	barley oats rye wheat	planting-time seed treatment only	barley - 65g/25 kg of seed oats - 92g/25 kg of seed rye - 56g/25 kg of seed wheat - 52g/25 kg of seed Unused, treated seed must be labelled as follows: Poisonous to man and animals. This seed has been treated with lindane and maneb. Do not use as food or feed.
IPCO M-N D.P. **Drill Box** lindane 18.75% & Maneb 37.5%	barley oats rye wheat	planting-time seed treatment only	barley - 65g/25 kg of seed oats - 92g/25 kg of seed rye - 56g/25 kg of seed wheat - 52g/25 kg of seed Unused, treated seed must be labelled as follows: Poisonous to man and animals. This seed has been treated with lindane and maneb. Do not use as food or feed.

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